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ABSTRACT

The potential of teacher centers to be more responsive to the mathematics inservice needs of teachers was investigated. A review of the literature on inservice education, mathematics, and teacher centers indicated the need for and the importance of high quality inservice for mathematics teachers. Questionnaires were filled out by thirteen college mathematics educators, twelve teacher center directors, and fourteen school mathematics supervisors. The first part of the questionnaire surveyed opinions on mathematics inservice needs, and the second part investigated current mathematics inservice activities in fifteen teacher center programs. Needs and the present amount of mathematics inservice available to teachers were identified in the areas of problem solving; mathematical applications; checking results of mathematical problems; mathematical approximation and estimation; computation; geometry; measurement; using graphs, charts and tables; probability; computer literacy; and teaching methods. Among the conclusions made was that significant differences exist in the views of the respondents regarding the need for inservice on using charts, graphs, and tables. Teacher center directors viewed a greater need for this topic than did the other two groups. There were no differences within the three groups regarding the needs for inservice on problem solving, applications, checking results, approximation and estimation, computation, geometry, measurement, probability, computer literacy, and methods of teaching. It was also concluded that inservice needs are not being met in the areas of problem solving, application, checking results, and probability. School mathematics supervisors viewed a greater need for problem solving and computer literacy and less need for computation and geometry inservice than the other two groups did. Recommendations based on this study are made for improving mathematics inservice education. The needs assessment instruments used in the study are appended. (JD)

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ABSTRACT

IMPORTANCE AND PRESENCE OF MATHEMATICS INSERVICE ACTIVITIES IN TEACHER CENTERS

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A Dissertation Submitted in Partial Fulfillment of
The Requirements for the Degree of
Doctor of Philosophy

WALDEN UNIVERSITY

April 1980

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The purpose of this study was to investigate the potential of teacher centers to be more responsive to the mathematics inservice of teachers than are college mathematics educators or school district administrators. This was done by constructing perceptual frameworks regarding the needs and presence of mathematics inservice activities for each of the three groups: teacher center directors, college mathematics educators and school mathematics supervisors. These mathematics areas were problem solving; application; reasonableness of results; approximation and estimation; computation; geometry; measurement; using graphs, charts and tables; probability; computer literacy; and methods of teaching.

The investigation was accomplished through questionnaires returned from: twelve federally funded midwest teacher center directors, thirteen college mathematics educators, and fourteen school mathematics supervisors within the service areas of the teacher centers. The questionnaire was divided into two parts. The first part surveyed the Mathematics Inservice Needs (MIN) and the second investigated the Mathematics Inservice Program (MIP).

The data were analyzed using non-parametric statistics, namely, the Kruskal-Wallis one-way analysis of variance test and the Mann-Whitney U-Test.

The following conclusions were made:

1. There are significant differences in the views of teacher center directors, college mathematics educators and school mathematics supervisors regarding the need for inservice on using charts, graphs and tables.

2. There are no significant differences within the three groups regarding need for or presence of mathematics inservice in problem solving, applications, reasonableness of results, computation, geometry, measurement, probability, computer literacy and methods of teaching.

3. There are five mathematics inservice areas of need that are not being met. These areas are: problem solving, applications, reasonableness of results, using charts, graphs and tables, and probability.

4. School mathematics supervisors view a greater need for problem solving and computer literacy and less of a need for computation and geometry inservice.

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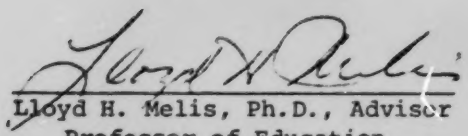

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CHAPTER I

PROBLEM STATEMENT

Background for the Problem

On October 12, 1976 the National Teacher Center program, PL 94 - 482, was signed into law by President Ford. The official statement authorizing federally funded teacher centers was as follows:

Sec. 532.

(a)(1) The Commissioner is authorized to make grants to local educational agencies in accordance with the provisions of this section to assist such agencies in planning, establishing, and operating teacher centers.

(2) For the purpose of this section, the term 'teacher center' means any site operated by a local educational agency (or a combination of such agencies) which serves teachers, from public and non-public schools of a State, or an area or community within a State, in which teachers, with the assistance of such consultants and experts as may be necessary, may

(A) develop and produce curricula designed to meet the educational needs of the persons in the community, area, or State being served, including the use of educational research findings or new or improved methods, practices, and techniques in the development of such curricula; and

(B) provide training to improve the skills of teachers to enable such teachers to meet better the special educational needs of persons such teachers serve, and to familiarize such teachers with developments in curriculum development and educational research, including the manner in which the research can be used to improve their teaching skills.

> (b) Each teacher center shall be operated under the supervision of a teacher center policy board, the majority of which is representative of elementary and secondary classroom teachers to be served by such center fairly reflecting the makeup of all school teachers, including special education and vocational education teachers. Such board shall also include individuals representative of, or designated by, the school board of the local educational agency served by such center, and at least one representative designated by the institutions of higher education (with departments or schools of education) located in the area (55:2154).

In the fall of 1978 the first grants were made and teacher centers began operating.

Nature of the Problem

Traditionally mathematics inservice for teachers has been planned and implemented by either college mathematics educators or school mathematics supervisors. These activities often took the form of an inservice college course or a district wide workshop. The National Education Association has referred to these as "imposed programs (that) have simply not met the needs of teachers and undoubtedly never will" (10:148). The teacher center movement has grown as an alternative form of inservice responsive to teachers' needs. In attempting to define teacher centers Devaney and Thorn referred to them as organizations each with:

> . . . a program providing continuing education for practicing teachers (mostly elementary teachers), which aims to be responsive to teachers' own definitions of their continuing learning needs rather than to school administrators', college professors' or curriculum committees' imposed agendas (14:3).

Federally funded teacher centers appear to be a vehicle for successful inservice. Besides being responsive to teachers' needs these centers exhibit synergy in terms of professional development. Harty (1978) defined

synergy in an educational context as the joining of two or more preparation/training elements, institutions or agencies to create an inservice program. This amalgamation, called a complex, could be more responsive to the needs of the teachers, the school district and the institutions of higher education. How it is envisioned to accomplish this is described in the following passage.

> Usually, there are few coordinated ways through which administrators and faculties can become aware of the needs, problems, and opportunities that confront them. Data derived from pupil, preservice teacher, inservice teacher, and professor evaluations can determine areas of weakness in achievement; however, these data are typically not well analyzed and exploited. A complex might provide opportunity for both systems to use innovative practices or materials or ameliorate or eliminate certain needs or problems purely by chance or because of special efforts of able and willing complex professional staff (23:337-345).

This research investigated the views of three groups regarding the perceived inservice needs and the perceived presence of mathematics education topics as part of teacher center activities. The views of teacher center directors were compared to those of college mathematics educators and school mathematics supervisors. The college mathematics educators were selected from colleges located near the teacher centers. The school mathematics supervisors were selected from those school districts with federal teacher centers.

The purpose of the study was to assess the potential for teacher centers being more responsive to the mathematics inservice needs of teachers than are college mathematics educators or school district mathematics supervisors.

Operational Definitions

Teacher Center Director: The teacher center director is the individual selected by the teacher center's governing board to be responsible for the center's program and activities.

College Mathematics Educator: The college mathematics educator is the instructor of elementary mathematics and/or elementary mathematics methods.

School Mathematics Supervisor: The school mathematics supervisor is a school district staff member who has the responsibility for the mathematics curriculum. This person's title may be mathematics supervisor, curriculum coordinator, director of instruction, or assistant superintendent in charge of instruction.

Problem Solving: Problem solving is the process of applying previously acquired knowledge to new and unfamiliar situations. It is characterized by analyzing situations, posing questions, drawing diagrams, and translating results (2:18-21).

Applying Mathematics to Everyday Situations: Mathematics is integrated with all daily activities. Students should be able to translate the situations to mathematical operations and then perform the appropriate steps (2:18-21).

Reasonableness of Results: The answer to a problem can be checked for acceptability and its reasonableness determined. This skill includes checking the answer in the original problem and reviewing the intermediate steps (2:18-21).

Estimation and Approximation: This skill includes rounding off numbers, estimating distances, quantities and weights using simple techniques (2:18-21).

Computational Skills: Complicated computations would be done with a calculator. The skills required would be basic number facts, addition, subtraction, multiplication and division of whole numbers and decimals and mental arithmetic ability (2:18-21).

Geometry: Geometry includes some special definitions such as perpendicular and parallel, and some concepts such as point, line, plane and dimensionality (2:18-21).

Measurement: Measurement includes the ability to tell time and temperature, find distances and weight in both metric and customary units. Work with angles, area and volume is also included (2:18-21).

Using Tables, Charts and Graphs: The skill of using tables, charts and graphs includes the reading and constructing of the displays as well as drawing conclusions from the information provided (2:18-21).

Probability: Elementary notions of probability are being able to decide if an event is random and when it is not random, using mathematics to make a prediction (2:18-21).

Computer Literacy: Computer literacy includes knowing how and when computers are used as well as being aware of their limitations (2:18-21).

Teaching Methods: In the teaching of mathematics, the teacher has a wide range of options regarding materials and activities. Teaching methods refers to these choices (2:18-21).

General Hypotheses for the Study

Teacher center directors and school mathematics supervisors will perceive computation and computer literacy as important topics that are not present in current mathematics inservice. The college mathematics educator will perceive problem solving, estimation and methods as the important topics that are not present in current mathematics inservice.

Significance of the Study

Teacher centers are rapidly becoming a major source of mathematics inservice. As such, they are meant to be most responsive to teachers' needs. Lovett and Schmieder in the Commissioner's Report on Education Professions 1975-76: Teacher Centers listed nineteen points outlining the major characteristics of the federal Teacher Center Program. Included in the list are these five items:

> It is directed primarily at helping teachers with current classroom instructional problems.
>
> It is a relatively flexible and open approach capable of responding quickly to immediate needs.
>
> Teacher center projects can serve both individual needs and system needs.
>
> It martials the best possible resources--from a great variety of sources--to help teachers with immediate instructional problems.
>
> It promotes an idea that could eventually serve all of the nation's teachers (33:134-135).

Teacher centers may become the inservice model of the future. One requirement for every federal teacher center was to have demonstrated an awareness of the needs of the teachers in the area it would serve. As with any other program the ability to respond to needs will determine the success or failure of teacher centers. This study will be one factor in

measuring the awareness of teacher centers to mathematics inservice needs.

Assumptions for the Study

For the purpose of this study some ideas about inservice education, federal teacher centers and mathematics inservice have been assumed to be true.

1. Teachers need to have more input when describing their needs and designing programs to satisfy those needs.
2. The federal teacher center model is well-defined and will become an important part of mathematics inservice education.
3. The teacher center director is a representative spokesperson for the teachers in regard to the teacher center functioning.
4. The mathematics inservice program needs to be changed from the traditional college coursework or short school district workshops.
5. The federal teachers center needs assessment process has included a review of the mathematics inservice needs of the teacher center's area teachers.
6. The mathematics content contains areas that may be isolated and assessed apart from the subject as a whole and distinct from the teacher-student interaction.

Limitations of the Study

The relative newness of the teacher center concept and some characteristics of the mathematics content area as well as the approach being used have placed some limitations on this investigation.

1. Although results were obtained regarding mathematics inservice, it is not reasonable to generalize these findings to other subject areas.
2. The results of the study relate only to federally funded centers or other centers of similar types.
3. The real needs of the teachers may be different from those identified by teacher center directors, college mathematics educators or school mathematics supervisors.
4. This study used a questionnaire. Terms used to identify mathematical ideas may not have been clearly understood by a teacher center director. Development of the instrument did include a teacher center director as a rater; but the difficulty may still have existed.
5. The school mathematics supervisor may have differing perspectives of their systems. Since school districts vary in size and personnel, the person may vary from a full-time mathematics supervisor to a generalist curriculum coordinator or an assistant superintendent in charge of instruction.
6. There were only sixty-one federal teacher centers funded during the first grant period. This study examined the fifteen midwest centers.

7. In order to delineate the field of mathematics, it was only possible to ask two questions about each area, as opposed to having a set of items for each area of mathematics inservice.

Summary

Teacher centers are a relatively new conceptual model for teacher inservice. Traditionally, mathematics inservice has been planned and conducted by college mathematics educators or school mathematics supervisors. As such, they have been considered as imposed programs. The teacher center program has been designed to be responsive to the needs of teachers. This research compares the views of three groups; teacher center directors, college mathematics educators and school mathematics supervisors, with respect to their views of mathematics inservice needs and existing mathematics inservice programs.

CHAPTER II

REVIEW OF LITERATURE

The research literature regarding mathematics inservice in operating federal teacher centers appears to be non-existent. This literature review will consider the need for quality inservice, examine present approaches to inservice education, and study the teacher center movement. Also, it will examine mathematics inservice and mathematics topics.

Inservice Education

The quality of the instructional program in schools is determined largely by the quality of the instructional staff. Therefore the inservice education of the staff is an important factor in the educational system. Inservice education is a continuation of preservice education. It builds upon the professional and personal background of individual educators and is designed to assist them in the further development of their instructional skills. Harris and Bessent (1969) defined inservice education as "planned activities for the instructional improvement of professional staff members." This definition of inservice education specifies programmatic efforts to improve instructional skills (22:54).

During the next ten years enrollment in grades K-12 is expected to continue to decline. One implication of this decrease in enrollment is that fewer teachers will be employed. Tenure and seniority will cause

school systems to retain currently employed teachers. This will result in fewer positions for recently trained teachers and a predominance of older teachers. Thus the role of inservice programs to renew the skills of the more experienced teachers is more important than ever before.

Otto and Erickson (1973) identified five significant results which may be expected from inservice education. They state that inservice can:

1. Unify and motivate educators to work towards common goals by providing an opportunity for teachers and administrators to air viewpoints which may result in identification of common needs.
2. Identify problems and suggest solutions.
3. Introduce and implement new ideas.
4. Improve accountability procedures by enabling teachers to diagnose pupil needs and prescribe individualized instruction.
5. Increase community support of education by involving parents in inservice activities (43:70-71).

Certainly inservice education is a continuation of preservice education. Moburg (1972) pointed out the importance of continuous teacher education when he stated "regardless of the quality of preservice programs, such programs are inadequate and insufficient to maintain the teacher on the job" (35:14). It is reasonable to expect an important principle of preservice education would also be a significant guide to inservice education. However, while preservice assumes a typical student and teacher relationship, inservice education does not necessarily possess this norm.

Flowers (1948) and Cogan (1975) claimed that teachers need more content, more methods and the ability to weld theory to practice (21:144, 8:215). Present inservice lacks both continuity to preservice education and a clearly defined set of objectives (6:44). Teacher inservice needs some direction. This direction should be the teachers prioritizing their own goals and creating their own plan for intellectual growth (7:222, 45:270, 46:297).

Traditionally, inservice education programs have attempted to update practicing teachers; orient preservice teachers into schools and communities; fill gaps between existing and desired professional knowledge and skills; and provide continuous professional development through activities such as workshops, conferences, lectures, demonstrations, discussion groups, buzz sessions, brainstorming sessions, and college course work. Inservice is in a state of evolution, and many innovative programs are being implemented.

One approach is the job-embedded or "on-site" approach. Activities employed in this approach involve teachers during their normal on-the-job activities. Examples of activities which could occur in the job-embedded approach are self and collegial observations, experimentation with new teaching techniques, and exploration of new ways of diagnosing learning obstacles.

Several observation and analytical techniques have been developed to assist supervisors, administrators, and teachers in improving the instructional program. One of the better known is the interaction analysis technique developed by Flanders (1970). This observational technique analyzes the interaction which occurs in classrooms. Based on the observations made by a trained observer, teachers learn to analyze their

own behavior and make necessary changes so that improved interaction between teacher and students will occur (21:305).

Micro-teaching is another observation technique used in inservice education. This technique allows teachers to plan short lessons which concentrate on specific instructional skills. The lesson is recorded on video-tape so that the teacher may view the lesson, evaluate it, and plan further improvement.

The synergetic process encourages teachers to look at their work analytically (4:60). This process includes a pre-observation conference in which the teacher discusses the goals and plan of the lesson with a supervisor, a careful observation of the lesson by a skilled observer, and a post-observation conference in which the lesson is analyzed using information obtained during the observation.

The advisory approach is another approach to inservice education (28:154-158). The advisor's role is nonjudgmental and nondirective in nature. Characteristics of the approach are: (1) assistance is provided only when it is requested by teachers; (2) assistance is provided to help the requestor meet his own goals; (3) assistance occurs in a classroom situation rather than by lecture or seminar; and (4) assistance is provided in such a way that teachers become more independent in solving their own problems.

Teacher Centers

Innovative approaches to teacher inservice education have been developing all over the world. Teachers' centers are one expression of teacher control over their own professional destiny. Devault (1974)

described them as informal, non-evaluative environments which provide access to a variety of homemade materials and teaching tools (15:37-39).

The Teacher Center movement in Britain was initiated by requirements of the Nuffield Foundation (15:37-39). The Foundation, involved in curriculum development in mathematics, science, and modern languages, required teachers to meet to share their experiences with new instructional materials.

British Centers are controlled by teachers and are largely voluntary. Executive committees are predominantly made up of teachers, but headmasters and personnel from institutions of higher education, teacher unions and boards of education are represented.

The focus of British Centers encompasses one of three areas: service, workshop, or social. Service oriented centers provide teaching materials such as audio-visual equipment, reproductive equipment, and advisory help. The focus of workshop type centers is on obtaining consultants who provide short-term workshops, arrange course offerings conducted by institutions of higher education faculties, or on encouraging teachers to serve as leaders of study groups. Centers having a social emphasis serve as meeting places where teachers can meet to discuss educational topics in nonthreatening surroundings. Teachers determine the focus of the area center such that it will best help them meet their professional needs.

Flowers (1948) recommended the welding of theory to practice. At that time the Committee on Professional Laboratory Experiences stated the following as their first principle:

> The particular contribution of professional laboratory experiences to the professional education of teachers is three-fold: (1) an opportunity to implement theory--both to study the pragmatic value of the theory and to check with the student

> his understanding of the theory in application; (2) a field of activity which, through raising questions and problems, helps the student to see his needs for further study; and (3) an opportunity to study with the student his ability to function effectively when guiding actual teaching-learning situations (21:144).

The teacher center provides the vehicle for placing theory into practice.

Typically, the classroom teacher has been identified as the practitioner and the university instructor as the theorist. The view that each group has held of the other has always contained negative connotations. The classroom teacher saw the university instructor as the textbook based idealist that did not have to cope in the classroom on a day to day basis. On the other hand, the university instructor viewed the classroom teacher's work as the same thing, year after year, unwilling to change. This somewhat of an adversary position has contributed significantly to the lack of real communication between the classroom teacher and the university instructor. Reducing the distance between these two groups will improve both the theory that is being implemented and the practice that is being researched. In order to accomplish this, an appropriate setting and framework is required for communications to take place. Teacher centers provide this setting. The unique characteristics that teacher centers possess are (1) an open governance system, (2) a dedication to providing inservice, and (3) a forum for sharing.

The exact definition of a teacher center is elusive. Edelfelt and Orwell (1978) respond as follows to the question: "What is a teacher center?"

> It is most often a place (but it could also be an idea) around which teachers gather, individually or in groups, to get help with the immediate and everyday problems they face in teaching. A teacher center is also characterized by a feeling, a feeling of being in a place where you can

> get advice and support from people you trust. You're there because you want to be, and the human resources you draw upon are likely to be your peers and staff, people who have no authority over you, who are not in positions to assess your capabilities and intentions, and who cannot penalize you for what you do or do not know. A teacher center is also a place where you call the shots in terms of the kinds of resources you want, rather than having them thrust upon you (16:8).

Schmeider and Yarger (1974) suggest a teacher center is an organization that attempts to respond to the following questions:

1. How can curriculum development and staff development be effectively integrated?

2. How can generally uncommunicative, sometimes unfriendly educational constituencies (students, teachers, administrators, supervisors, college and university staff, interested community) best share experiences and resources?

3. How can preservice and inservice educational personnel development be successfully linked?

4. And, probably most important, how can educational personnel be continually renewed in their ability and vigor? (50:5-11)

It appears that the above descriptions are approximations of the federal teacher centers. In all probability these centers will be the models for all future teacher centers in the United States. The federal guidelines require the establishment of a teacher center policy board as the governing force for the center's activities. This policy board is required to contain representatives from the teaching constituencies the center is to serve as well as at least one representative of a nearby college of education. The resulting centers are of a collaborative nature involving the needs of teachers, the school district and the university. The key to any teacher center's success is that the university and school personnel work together as equals. This results in benefits to all groups involved.

The most important characteristic of a teacher center to weld theory to practice is its governance structure. Certainly a governing board whose members represent two separate institutions presents a forum for take-overs by one of the groups. Yarger and Mallan (1975) state this distribution of power is acceptable if participants each review their own needs and the opportunities, and that collaboration may assist each in determining their missions (60:16). Collins (1974) describes how the institutional needs of a school system mesh very well with those of a university. The school system needs instructional improvement, inservice training, and curriculum development, while the university needs research laboratories, sites for field experiences, sites for program validation, and preservice training (9:13-17). The following chart diagrams the possible relation between these two sets.

School System Needs	University Needs
Inservice Training	Sites for Program Validation
Instructional Improvement	Sites for Field Experiences
Curriculum Development	Research Laboratories
	Preservice Training

A similar diagram may be presented for the personal needs of teachers in the school system and college instructors. The teachers need instructional materials development, inservice training and shared decision making in regard to curriculum and professional matters. The college instructors need research and development sites, sites for laboratory experiences for preservice students and sites to validate and field test innovative programs and instructional materials (9:13-17).

Teachers	College Instructors
Instructional Materials Development	Sites to validate and field test innovative programs and instructional materials
Inservice Training	Research and Development sites
Shared decision making in regard to curriculum and professional matters	Sites for laboratory experiences for preservice students

Therefore through the opportunities presented by the shared governance situation of a teacher center board, both institutional and personal needs may be integrated for the common good of all participants. Also working together to make the teacher center functional will destroy inaccurate preconceived views teachers have of college instructors and vice-versa.

Closely related to the shared governance concept is the commitment of both teachers and college instructors to improving education through inservice. Bell and Peightel (1976) gave the following response to the query, What do teachers want from inservice education?

> The last thing teachers want or expect from inservice education is a waste of time. They do not believe that sitting through a lecture from a professor about the sociological impact of reading or how Dewey was a gift from heaven is going to improve their teaching--unless they get a chance to sneak a catnap. Teachers want to explore new methods and develop skills, to try out new materials, and, in a nonthreatening way, meet their individual needs. These activities can all be developed much more successfully over a period of time than in a one-day workshop, which is one reason the teacher center developed (3:10).

They then identify five major areas of concern teachers have regarding inservice. These areas are:

1. Developing Alternate Learning Environments
2. Meeting Teachers' Individual Needs

3. Creating Informal, Nonthreatening Inservice Environments

4. Improving Basic Teaching Skills

5. Exploring New Methods, Media, and Materials

Since representatives from the university and the schools jointly decide both the form and format of the teacher center's program, these five areas of concern will either directly or indirectly be considered.

Finally, the open governance and shared decisions involving inservice present new opportunities for sharing. Classroom teachers are asked to present ideas to preservice teachers on instructional methods, teachers' unions or school and community programs, while the university instructor is invited into a classroom to demonstrate a micro computer or to test a new approach to a topic or a new educational theory. This appears to be the bridge over the gap Schmeider (1975) refers to in the following excerpt.

> Practitioners have very serious needs, researchers have been working on these needs, but very few have been concerned with bridging the gap between the two. We need to find a more effective means to get what works into the classroom (49:22).

The teacher center is an effective means of welding theory to practice because it provides for an open, collaborative governance that forces consideration of both school needs and university needs. These institutional needs are also considered in light of the personal needs of the classroom teacher and the university instructor. This opportunity to meet these real inservice needs in a new way in turn presents a new opportunity for communication and sharing. This sharing, in turn, generates new understandings which creates new opportunities and the process of collaboration continues.

Although collaboration within teacher centers has been shown as an effective mechanism for producing a format to weld theory to practice, there are still concerns. These concerns are innumerated by Yarger (1979) as five uncomfortable assertions about collaboration. They are as follows:

1. Collaboration in teacher education is becoming an end unto itself and is not a means for improving programs.
2. Collaborative structures in teacher education tend to disrupt existing governance mechanisms.
3. Collaboration is often not related to quality or improvement in program development.
4. Collaboration operates against competent program developers functioning freely and exhibiting sensitivity to their clients.
5. Unless collaborative governance structures operate as support systems for competent program developers, the process will lower rather than raise the quality of programs (59:5-13).

Although the federally-funded teacher centers offer a variety of programs, the overall picture that they present is somewhat of a standard model. There are things that all federal teacher centers have in common. These are such items as: policy board, defined service areas, type of grant and source of funds. However, at the same time there exists a great deal of diversity between individual centers. Yarger (1979) explained the reason for this diversity when he examined the groups that influenced the teacher center legislations. The two teacher organizations, National Education Association and American Federation of Teachers, certainly were

concerned about this law. Besides this, there were school district administrator groups and state level education groups that felt that this federal program could be a serious challenge to their authority. Yet another group, the colleges and universities felt this was a dangerous threat to their territory of preservice and inservice teacher education. Yarger aptly defined the final teacher center legislation as "a federal program structure that would have made Rube Goldberg glow with pride and satisfaction" (59:2).

As in Britain, teacher centers in America are controlled by teachers, but they have advisory boards including other professional groups. Two characteristics of American teacher centers are that they are designed to meet immediate needs of teachers and they utilize other constituencies in the field of education.

The teacher center is a model that should provide theory to teachers and make it functional in the classroom. Its operating objectives are to (a) remedy weaknesses in preparation, (b) enlarge the scope of competencies, and (c) support innovations (11:36). Teacher centers try to increase the control that teachers have over their professional development (12:6, 31:450-455).

Schmieder (1974) described seven organizational types of teacher centers existing in the United States (49:28-30). Independent teaching centers are voluntary and are concerned with teacher needs rather than institutional concerns. These centers are independent of any formal affiliation with organized educational agencies. Almost all independent teaching centers are linked with an educational institution such as a school system or institution of higher education. The participation is voluntary, and

emphasis is on the needs of the participant rather than on institutional goals. Professional organization teacher centers have two sub-types. The "negotiated" teacher center tends to focus on professional as well as educational problems. "Subject area" centers emphasize classroom subjects such as mathematics or science. The single unit teaching center is one associated with an educational institution. The programs focus upon institutional goals. The free partnership teaching center is based on the consortium concept. It usually involves a school system and an institution of higher education. Goals of the center attempt to meet the needs of both partners. The free consortium teaching centers involve three or more institutions in a teaching center relationship. Organization and commitments are more formal and complex than in the free partnership teaching center. Programs are more general since needs of all partners must be considered. Legislative/Political consortiums are prescribed by legislative mandate or by political influences. Often the State Department of Education oversees and influences the goals of this type of center.

The Education Amendments of 1976 allow local education agencies to plan, establish, and operate teacher centers which will: (a) develop and produce curricula, (b) provide training to improve the skills of teachers, and (c) familiarize teachers with developments in curriculum development and educational research. Governance of each teacher center is to be under the supervision of a policy board composed of K-12 teachers. The governing board must include vocational and special education teachers and at least one representative of an institution of higher education.

The federally funded teacher centers have been designed to be successful forms for inservice education. Yarger (1977) reported that the Lawrence review of the literature completed in 1974 includes a number of

studies to identify characteristics of successful inservice education. His analysis resulted in the following seven items associated with successful inservice education.

1. Individualized inservice education tends to be better than single offerings for large groups.

2. Active involvement inservice programs tend to be better than passive-receptive involvement.

3. Demonstration of skills with supervised feedback tends to be better than the provision of skills to be stored for future use.

4. Teacher-help-teacher inservice tends to be better than teacher-work-alone inservice.

5. Inservice that is integrated into a large program tends to be more effective than one-shot affairs.

6. Inservice that has an emerging design with teacher input tends to be better than totally planned inservice.

7. Self-initiated inservice tends to be more effective than self-prescribed inservice (56:24).

From this list Yarger concluded the following:

> One of the most important conclusions that can be drawn from Lawrence's analysis is that effective inservice programs are usually conceptualized, designed and implemented at the site-specific level (57:24).

He then proceeded to delineate how this generalization is incorporated into the federal funded teacher center program.

> PL 94-482, which authorizes the federally sponsored teacher center program, is a relatively permissive piece of legislation but it also has some very important specific requirements. Primary among these relates to the locus for decision-making, and the scope of decisions that can be made. Succinctly, nearly all decisions concerning the operation of a teacher center must occur at the site-specific level, and must not be imposed by external authorities, far removed from the scene (57:29).

One may therefore conclude that the teacher centers funded under this federal program have the potential to be successful inservice education activities.

Mathematics Inservice

The mathematics inservice program has mainly consisted of college coursework and/or some form of required district inservice program. Although a survey of mathematics teachers by the National Council of Teachers of Mathematics (1976) indicated that 88 percent felt there was a need for inservice, 61 percent felt the inservice education did not fit classroom needs (39:92). This idea was presented by Harty and Schmoll (1979) for inservice in general (not specifically mathematics) in the following comment:

> Past disillusionment with inservice programs has stemmed mainly from the charge that college or university sponsored inservice programs have not been relevant to teacher needs. Educators in higher education have, conversely, implied that teachers don't always know what is best for them. The most recent and widely accepted concepts of and models for inservice education previously discussed emphasize improving teacher effectiveness and utilizing teacher input, yet most inservice programs continue to be either campus-based or within-the-system (24:3).

There appears to be little question about the dissatisfaction of inservice in general, and specifically mathematics inservice.

Studies relating to the California legislature mandated mathematics inservice did indicate that students of teachers who attended inservice did have higher achievement levels (39:5). There also exist follow-up studies of federally funded projects that provide evidence that the teachers inservice participation helps student achievement (62:56, 28:110, 57:431-439).

Suydam and Osborne (1978) reported that "the critical factor in determining the teacher's perception of the effectiveness of the inservice education is the extent to which planning is participatory" (16:4).

As a part of the 1977 National Survey of Science, Mathematics and Social Studies Education study, teachers were asked to rate the usefulness of various sources of information. The following results were reported:

For local subject specialists/coordinators:

> Ratings of very useful were received from 25% of K-3 teachers, 20% of 4-6 teachers, 19% of 7-9 teachers and 12% of 10-12 teachers.

For college courses:

> Ratings of very useful were received from 41% of K-3 teachers, 34% of 4-6 teachers, 35% of 7-9 teachers and 37% of 10-12 teachers.

For local inservice:

> Ratings of very useful were received from 44% of K-3 teachers, 36% of 4-6 teachers, 25% of 7-9 teachers and 19% of 10-12 teachers (57:152).

From this, one can observe that greater than 50 percent of teachers in any of the groups are looking to other sources for useful inservice.

Delessert (1966) identified the total area of mathematics teaching needs as including four aspects.

1. The social aspect: the role of the school in society; the role of the teacher in school, in life, etc.

2. The psychological aspect: a knowledge of oneself, of children, of adults.

3. The cultural aspect: the place of mathematics in a harmonious education; the personal culture of the teacher who, in the eyes of his students, must not be a barbarian with one specialty.

4. The technical aspect: on the one hand, the acquisition of strictly mathematical knowledge and skills; on the other a paramathematical background including the history of mathematics, philosophic problems raised by mathematics, the psychology of the mathematician, the role and significance of mathematics (11:279).

Although mathematics inservice may be involved with all four aspects, it is most often thought of with respect to aspect three and four; the cultural and technical aspects.

In order for teachers to better identify inservice needs they must be involved in the continual examination and definitions of goals and objectives of the school mathematics program. Teachers are not the only source of goals for the mathematics instruction. Parents, the scientific community and society in general have a role in this important task. The teacher is often the spokesperson who is responsible for synthesizing the information from all other sources.

Besides being aware of outside sources and their input to the mathematics curriculum, the teacher must know the school's total mathematics program. Being aware of the entire school's mathematics program requires the teachers to look beyond the classes they teach and beyond the teaching level to the entire K-12 mathematics program.

An area in need of mathematics inservice will be recognized as one where there exists a large discrepancy between the stated mathematics goals of the district and the mathematics achievement of the students in the specified area. This process of locating these areas is then the needs assessment.

This approach assures that the needs assessment is related to the mathematics curriculum and to student's performance. Hopefully, this

process simply supplies data to the personal opinion of teachers as to the areas of apparent needs within the mathematics curriculum.

The necessary data is often already collected and available within the schools. An analysis of this information may be completed by creating profiles of high-achieving students and low-achieving students. These profiles may then be compared to the stated goals of the mathematics curriculum. From this comparison a list of the areas of need may be established and priorities assigned.

The process should not be done in isolation. It is essential to work with teachers. The collected information can be provided to them for their consideration and professional assistance in providing feedback to process and commitments to the established priority of needs.

An example of this model was used by the Oregon Mathematics Education Council (OMEC). Nesseth (1975) reports the work was done on a statewide basis in order to provide a "systems" approach to mathematics inservice (40:585). Thomas (1975) identified the activity as:

1. Describing existing conditions;
2. Identifying desired circumstances; and
3. Determining measures of significance between what exists and what is desired.

He refers to these differences, or discrepancies, as "gaps." Decisions were then made based on these gaps by asking if they were (a) significant and (b) important. Significant meant of sufficient size. Important had two meanings. The first was that there existed an urgency to attend to the situation because it was increasing in size. The second was the gravity of the situation. That is, how critical was it and how many individuals were affected by the gap (54:1).

The use of this model may take on the following form. It is assumed the teachers are informed of the districts' mathematics goals and the results of standardized assessments. From these a set of topics is created and the teachers are asked to respond to the need for inservice regarding each topic.

Such a process is ideally suited to the mode of operation for a teacher center in deciding an appropriate mathematics inservice program.

Teachers' desires are reported in the mathematics section of a National Science Foundation study by Ingison (1978) as the following:

> Teachers want inservice education and prefer that it be related to programmatic and instructional needs, and be neither purely mathematical nor purely methodological (27:24).

This supports the premise that a teacher center would be a viable source of mathematics inservice.

Mathematics Topics

A response to the question "What are the essentials of education?" has recently been endorsed in a position statement by the twelve educational associations. These associations represent more than 400,000 educators. This position statement is entitled "The Essentials of Education." This document states that the ultimate goal of education should be "to develop informed, thinking citizens capable of participating in both domestic and world affairs." The paper states:

> A definition of the essentials of education should avoid three easy tendencies: to limit the essentials to "the three R's" in a society that is highly technological and complex; to define the essentials by what is tested at a time when tests are severely limited in what they can measure; and to reduce the essentials to a few "skills" when it is obvious that people use a combination of skills, knowledge, and feelings to come to terms with their world (1:1).

And goes on to elaborate in the following manner:

> More specifically, the essentials of education include the ability to use language, to think, and to communicate effectively; to use mathematical knowledge and methods to solve problems; to reason logically; to use abstractions and symbols with power and ease; to apply and to understand scientific knowledge and methods; to make use of technology and to understand its limitations; to express oneself through the arts and to understand the artistic expressions of others; to understand other languages and cultures; to understand spatial relationships; to apply knowledge about health, nutrition, and physical activity; to acquire the capacity to meet unexpected challenges; to make informed value judgments; to recognize and to use one's full learning potential; and to prepare to go on learning for a lifetime (1:1).

The associations contributing to and endorsing this position are American Alliance for Health, Physical Education, Recreation and Dance; American Council on the Teaching of Foreign Languages; Association for Supervision and Curriculum Development; International Reading Association; Music Educators National Conference; National Art Education Association; National Association of Elementary School Principals; National Council for the Social Studies; National Council of Teachers of English; National Council of Teachers of Mathematics; National Science Teachers Association; and Speech Communication Association.

This statement on essentials for education is compatible with the "Basic Skills" position recently endorsed by the mathematics education community. To see how this position was established, it is necessary to look at how the question of "What mathematics should be taught?" has been handled in the past. The National Council of Teachers of Mathematics has attempted to answer that question in Part Two by DeVault and Weaver of the Thirty-second Yearbook (1970). For the years 1607 to 1894 the mathematics was computations with denominate numbers. These numbers often represented physical measurements. Mensuration and certain geometry topics were also

included. For the period 1894 to 1923, there was an impact on the way the mathematics was taught. These changes came from the works of Dewey, Hall and Thorndike. However, these developments did change the content of the mathematics discipline. The period of 1923 to 1952 was described as the "low point in mathematicians involvement in the elementary school program." The changes were directed by educational psychologists. The mathematics was not recognized as a "tool subject but rather a part of the cultural heritage which required educational attention in its own right." The years 1952 to 1970 was referred to as the revolutionary period. Set theory, new algebras, and new geometries had an impact on the elementary school mathematics program. Initially mathematicians made improvement in the content area. Then mathematicians began to work with educators and psychologists. This resulted in an integration of mathematics with other subject areas (36:99-140).

Evidence of this work was seen in the Twenty-fourth Yearbook of the NCTM (1959) which was organized around the following unifying ideas:

1. Numbers and operation
2. Relations and functions
3. Proof
4. Measurement and approximation
5. Probability
6. Statistics
7. Language and symbolism
8. Mathematical modes of thought

The preface of the yearbook stated: "These modes are not quite mathematical concepts themselves, but are rather understandings and procedures which are implicit in the study of all mathematical topics" (37:V). This concern for

unifying mathematical ideas or strands led to a reinterpretation of the mathematics content.

The idea of strands was used extensively by several groups to reorganize the mathematics content. Typical partitions were developed for nearly every textbook series.

Saunders (1980) divided the K-12 mathematics into five major areas and sixty-one total areas preparing a response to the often asked student question, "When are we ever gonna have to use this?" He then cross-tabulated this with a list of ninety-eight occupations from Accountant and Accounting Systems Analyst to Waitress and Wastewater Treatment Operator. This provides a 61 x 91 matrix which could be used for grouping and then forming some meaningful comparisons (48:10).

These partitionings all claim to present minimal skills essential for today's society. However, it is easy to note that a large percentage of the skills are arithmetic or computational skills.

During the early 1970's these computational abilities were equated to mathematical competence in the public's view. At the same time standardized achievement tests scores were declining and there were increased demands for accountability. In response to this situation the National Institute of Education (NIE) held a Conference on Basic Mathematical Skills and Learning in Euclid, Ohio in October 1975. Thirty-three papers on Basic Mathematical Skills were presented by mathematicians and mathematics educators.

A report from the Euclid Conference was circulated at the 1976 meeting of the National Council of Supervisors of Mathematics (NCSM). At this time the NCSM decided to prepare a Position Paper on Basic

Mathematical Skills. With the support of the NIE, the NCSM began to formulate their statement. The process used was to:

1. Solicit written input from all members;
2. Select a pool of NCSM members representative of geography, grade level, and community to meet and write the first draft;
3. Seek the reaction of the entire NCSM membership to the statement.

The resulting position paper was later adopted in its entirety by the NCTM. The paper identified ten basic skill areas as follows: Problem Solving; Applying Mathematics to Everyday Situations; Alertness to the Reasonableness of Results; Estimation and Approximation; Appropriate Computational Skills; Geometry; Measurement; Reading; Interpreting and Constructing Tables, Charts, and Graphs; Using Mathematics to Predict; and Computer Literacy. The paper went on to stress the importance of providing for the developing of these skills by a variety of teaching methods to accommodate different student learning styles.

Summary

The review of literature considered the need for inservice education, current inservice education practices, the teacher center movement, mathematics inservice and mathematics topics.

The review noted a need for quality inservice education as a continuation of preservice education. This inservice should include more content, more methods, and the ability to weld theory to practice. Traditional approaches to inservice education fail to satisfy existing needs. However, teacher centers, particularly the federally funded centers, have

been designed to be a successful format for inservice education. Both the required governance structure and the necessity of collaboration contribute to the success of teacher center inservice programs. The governance structure provides the setting and opportunity to weld theory to practice. The collaboration between college teachers, administrators, and school-based personnel results in meaningful inservice activities.

There exists evidence to indicate that the students of teachers who participate in mathematics inservice have increased mathematics achievements. For the mathematics inservice to be successful, the teachers should be involved in its planning. Provision for this participation in the planning process is included in the governance structure of teacher centers. Furthermore, there exists agreement on eleven basic skill areas of mathematics education. These areas are (1) Problem Solving, (2) Applying Mathematics to Everyday Situations, (3) Reasonableness of Results, (4) Estimation and Approximation, (5) Computational Skills, (6) Geometry, (7) Measurement, (8) Using Tables, Charts and Graphs, (9) Probability, (10) Computer Literacy, and (11) Teaching Methods.

CHAPTER III

METHODOLOGY

Perspective

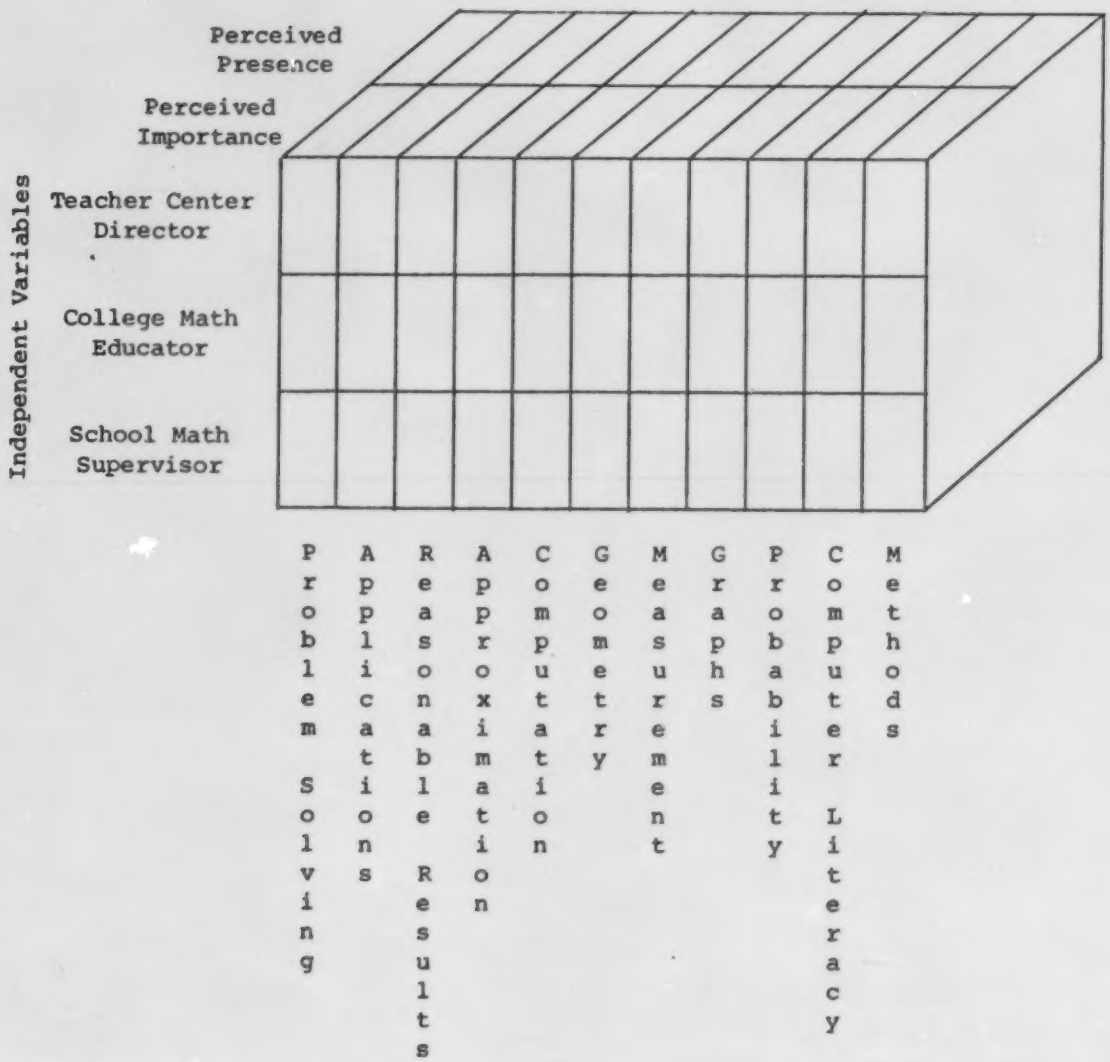
The study utilized a questionnaire to collect information. This information represented the perceptual frameworks of teacher center directors, college mathematics educators and school mathematics supervisors. The framework was in reference to the need for and presence of inservice in the mathematical areas of problem solving; application; reasonableness of results; approximation and estimation; computation; geometry; measurement; using graphs, charts and tables; probability; computer literacy; and methods of teaching. The study contained a 3 x 11 x 2 factorial design. Figure A is a diagram of the research design for the study.

Testable Hypotheses

The three independent variables were compared regarding importance and presence of each of the dependent variables. Then for each dependent variable, the independent variables were compared with respect to importance and presence. Finally, the set of dependent variables was compared for each of the independent variables. The three independent variables, eleven dependent variables and two measures yielded fifty-eight testable hypotheses.

FIGURE A

RESEARCH DESIGN FOR THE STUDY



H_1: There are no significant differences in the perceptual framework of teacher center directors, college mathematics educators and school mathematics supervisors regarding the need for problem solving inservice.

H_2: . . . applications inservice.

H_3: . . . reasonableness of results inservice.

H_4: . . . approximation and estimation inservice.

H_5: . . . computation inservice.

H_6: . . . geometry inservice.

H_7: . . . measurement inservice.

H_8: . . . using charts, graphs and tables inservice.

H_9: . . . probability inservice.

H_{10}: . . . computer literacy inservice.

H_{11}: . . . methods of teaching inservice.

H_{12}: There are no significant differences in the perceptual framework of teacher center directors, college mathematics educators and school mathematics supervisors regarding the presence of problem solving inservice.

H_{13}: . . . applications inservice.

H_{14}: . . . reasonableness of results inservice.

H_{15}: . . . approximation and estimation inservice.

H_{16}: . . . computation inservice.

H_{17}: . . . geometry inservice.

H_{18}: . . . measurement inservice.

H_{19}: . . . using charts, graphs and tables inservice.

H_{20}: . . . probability inservice.

H_{21}: . . . computer literacy inservice.

H_{22}: . . . methods of teaching inservice.

H_{23}: There are no significant differences between perceived importance and perceived presence of problem solving activities among the perceptual framework of teacher center directors.

H_{24}: . . . applications . . . .

H_{25}: . . . reasonableness of results . . . .

H_{26}: . . . approximation and estimation . . . .

H_{27}: . . . computation . . . .

H_{28}: . . . geometry . . . .

H_{29}: . . . measurement . . . .

H_{30}: . . . using charts, graphs and tables . . . .

H_{31}: . . . probability . . . .

H_{32}: . . . computer literacy . . . .

H_{33}: . . . methods of teaching . . . .

H_{34}: There are no significant differences between perceived importance and perceived presence of problem solving activities among the perceptual framework of college mathematics educators.

H_{35}: . . . applications . . . .

H_{36}: . . . reasonableness of results . . . .

H_{37}: . . . approximation and estimation . . . .

H_{38}: . . . computation . . . .

H_{39}: . . . geometry . . . .

H_{40}: . . . measurement . . . .

H_{41}: . . . using charts, graphs and tables . . . .

H_{42}: . . . probability . . . .

H_{43}: . . . computer literacy . . . .

H_{44}: . . . methods of teaching . . . .

H_{45}: There is no significant difference between perceived importance and perceived presence of problem solving activities among the perceptual framework of school mathematics supervisors.

H_{46}: . . . applications . . . .

H_{47}: . . . reasonableness of results . . . .

H_{48}: . . . approximation and estimation . . . .

H_{49}: . . . computation . . . .

H_{50}: . . . geometry . . . .

H_{51}: . . . measurement . . . .

H_{52}: . . . using charts, graphs and tables . . . .

H_{53}: . . . probability . . . .

H_{54}: . . . computer literacy . . . .

H_{55}: . . . methods of teaching . . . .

H_{56}: There are no significant differences among identified inservice needs within the perceptual framework of teacher center directors.

H_{57}: . . . college mathematics educators.

H_{58}: . . . school mathematics supervisors.

Description of Subjects

In this study the sources of data were fifteen federally funded teacher center directors, fifteen mathematics educators and fifteen school mathematics supervisors. The fifteen teacher center directors reflected a total population. This population comprised the midwest region of the

United States with respect to federally funded teacher centers. The fifteen mathematics educators were instructors from higher education institutions located near the centers. This represented a non-random sample of college mathematics educators. The fifteen school mathematics supervisors were selected from school districts which were the fiscal agents for the centers. This was a non-random sample of school mathematics supervisors. These fifteen locations were: Chicago, Illinois; Edwardsville, Illinois; Columbus, Indiana; Gary, Indiana; Indianapolis, Indiana; West Lafayette, Indiana; Cedar Falls, Iowa; Paducah, Kentucky; Livonia, Michigan; Normandy, Missouri; Cincinnati, Ohio; Bowling Green, Ohio; Clarksville, Tennessee; Oak Ridge, Tennessee; LaCrosse, Wisconsin. A complete list is in Appendix A.

Instrumentation

The content area of the investigation was mathematics inservice. The identification of the areas that make up mathematics education has been done by the National Council of Supervisors of Mathematics and the National Council of Teachers of Mathematics. These areas are regarded as the "basics" of school mathematics. The development of these areas was done by the National Council of Supervisors of Mathematics working under a contract with the National Institute for Education. In their work this group solicited input from a large representation of the membership. Working drafts were presented and reviewed at National meetings. The final position paper was published in October 1977 (2:18-21). From these eleven areas a twenty-two item Likert-like instrument was developed. A copy of the instrument may be found in Appendix B. The instrument was then submitted to a panel of five mathematics educators for review and validation. The

instrument's content validity test form is in Appendix C. The panel members consensus was that the instrument was a relevant representative sample concerning the important topic issues of mathematics inservice. The summary of this evaluation may be found in Appendix D.

For reliability the instrument was tested by determining a Pearson's product moment correlation coefficient. The test subjects were two mathematics supervisors, two mathematics educators and a teacher center director. In two administrations, each one week apart, the response correlation was 0.80. The summary of these data can be found in Appendix D.

Procedures

The instrument was mailed along with a self-addressed stamped envelope to the fifteen teacher center directors, fifteen mathematics educators and fifteen school mathematics supervisors during the fall of 1970. Each form was coded for the three groups of respondents. For returning the completed questionnaire each respondent was offered a copy of the instrument and a classroom idea book recently published by the Teacher Place, an independent teacher center in southeastern Wisconsin. The cover letter that accompanied the questionnaires may be found in Appendix A. After ten days a follow-up contact was made to all non-respondents.

Data Analysis

Two nonparametric analysis of variance tests, the Kruskal-Wallis and the nonparametric Mann-Whitney U-test were used to analyze the data. The sample size was small and non-random and the data did meet the requirements for nonparametric treatment. The Kruskal-Wallis one-way analysis of

variance allowed testing to determine whether the three independent variables; teacher center directors, college mathematics educators and school mathematics supervisors possessed significantly different viewpoints with respect to the inservice topics. Therefore, this test was appropriate for the data related tc H_1 through H_{22} and H_{56} through H_{58} (52:184-188). The Mann-Whitney U-test was used to compare for differences between the perceived need for inservice with the perceived presence of inservice as they related to a particular mathematics topic. This test was employed for H_{23} through H_{55} (52:116-121). The test analysis was completed using the services of the University of Wisconsin-Whitewater Computer Center.

Summary

The study used a 3 x 11 x 2 factorial design. The three independent variables were compared regarding importance and presence of each of the dependent variables. The three independent variables were teacher center directors, college mathematics educators, and school mathematics supervisors. The eleven dependent variables were problem solving, applications, reasonableness of results, approximation, computation, geometry, measurement, graphs, probability, computer literacy and teaching methods.

The subjects used for the study were fifteen teacher center directors, fifteen college mathematics educators and fifteen school mathematics supervisors. A questionnaire was designed to measure the need for and presence of mathematics inservice topics.

The collected data was analyzed using the Kruskal-Wallis one-way analysis of variance and Mann-Whitney U nonparametric statistics tests.

CHAPTER IV

RESULTS

The Study

The teacher center directors of the fifteen federally funded teacher centers in the midwest region of the United States were surveyed, along with a college mathematics instructor and a school mathematics supervisor for each center. Of the total forty-five questionnaires distributed, thirty-nine (87 percent) were returned. Twelve teacher center directors, thirteen college mathematics instructors and fourteen school mathematics supervisors responded.

Data Summary

The collected data were tabulated by computer process. Kruskal-Wallis and Mann-Whitney U-tests were used to determine significant differences. The results were summarized in tabular form. Inferences and conclusions were drawn from the resultant tables.

Discussion of the Results

The purpose of the study was to assess if teacher center directors' views of mathematics inservice of teachers are significantly different from those of college mathematics educators and school district mathematics supervisors. The study examined the inservice views of the three groups by creating the perceptual framework each held with respect to mathematics topics.

The first eleven hypotheses (H_1 to H_{11}) examined the perceptual frameworks of the three groups with respect to the need for one of the identified mathematics topics inservice. The second eleven hypotheses (H_{12} to H_{22}) investigated the perceptual frameworks with respect to the existence of each of these mathematics topics in current inservice programs. Table 1 exhibits the summary statistics for the first twenty-two hypotheses. There was one topic that yielded significant results. This was the need for inservice using charts, graphs, and tables. The need for inservice using charts, graphs and tables was established at a significance level of $P < .05$. Further examination of Table 1 indicates that the greatest disparity exists between the views of teacher center directors and school mathematics supervisors.

As the first half of Table 1 indicates, the remaining areas of inservice need failed to reveal significant differences in the views of teacher center directors, college mathematics educators and school mathematics supervisors. Likewise, the second half of Table 1 indicates the areas regarding existing mathematics inservice topics failed to produce significant differences in the views of the three groups.

Hypotheses twenty-three through thirty-three examined the perceptual framework of teacher center directors by comparing the perceived need for, and the perceived presence of, the eleven mathematics inservice topics. Significance in this set of hypotheses indicates that the teacher center directors view the mathematics topic as being an area of inservice need that is not being met by existing inservice programs. As Table 2 illustrates, significance was noted for problem solving; applications, reasonableness of results; measurement; using charts, graphs and tables; and probability. Significance was established for applications, using charts,

TABLE 1

MEAN RANKS AND SIGNIFICANCE LEVEL
FOR TEACHER CENTER DIRECTORS, COLLEGE MATHEMATICS EDUCATORS
AND SCHOOL MATHEMATICS SUPERVISORS WITH RESPECT TO
NEED FOR AND PRESENCE OF INSERVICE TOPICS

	Need For:	Teacher Center Director (Means)	College Mathematics Educators (Means)	School Mathematics Supervisors (Means)	Significance
H_1:	Problem Solving	18.91	16.88	22.39	0.427
H_2:	Application	23.50	19.12	17.82	0.423
H_3:	Reasonable Results	21.04	18.08	20.89	0.757
H_4:	Approximation	17.81	23.46	20.25	0.465
H_5:	Computation	23.96	10.50	17.07	0.302
H_6:	Geometry	21.50	21.42	17.39	0.565
H_7:	Measurement	23.25	20.19	17.04	0.382
H_8:	Using Charts	25.50	22.31	13.14	*0.015
H_9:	Probability	20.21	18.77	20.96	0.880
H_{10}:	Computer	18.13	19.50	22.07	0.666
H_{11}:	Methods	22.58	22.27	15.68	0.208

*Indicates significance at .05 level.
**Indicates significance at .01 level.

TABLE 1 (Continued)

MEAN RANKS AND SIGNIFICANCE LEVEL
FOR TEACHER CENTER DIRECTORS, COLLEGE MATHEMATICS EDUCATORS
AND SCHOOL MATHEMATICS SUPERVISORS WITH RESPECT TO
NEED FOR AND PRESENCE OF INSERVICE TOPICS

	Need For:	Teacher Center Director (Means)	College Mathematics Educators (Means)	School Mathematics Supervisors (Means)	Significance
H_{12}:	Problem Solving	21.71	19.81	18.71	0.798
H_{13}:	Applications	21.79	19.15	19.25	0.807
H_{14}:	Reasonable Results	20.38	21.23	18.54	0.821
H_{15}:	Approximation	25.54	19.23	15.96	0.098
H_{16}:	Computation	20.25	21.50	18.79	0.775
H_{17}:	Geometry	21.29	20.96	18.00	0.713
H_{18}:	Measurement	18.21	22.88	18.86	0.530
H_{19}:	Using Charts	22.21	22.81	15.50	0.181
H_{20}:	Probability	22.42	21.77	14.54	0.138
H_{21}:	Computer Literacy	23.50	18.15	18.71	0.438
H_{22}:	Methods	23.54	18.54	18.32	0.433

*Indicates significance at .05 level.
**Indicates significance at .01 level.

TABLE 2

TEACHER CENTER DIRECTORS PERCEPTIONS OF
NEED AND PRESENCE OF INSERVICE TOPICS

Mathematics Inservice Topics	Mean Ranks (n = 12) Need	Presence	U	Exact 2-tailed P
H_{23}: Problem Solving	15.00	8.58	25	*0.0206
H_{24}: Applications	16.67	8.33	22	**0.0029
H_{25}: Reasonable Results	15.75	9.25	33	*0.0242
H_{26}: Approximation	14.08	10.92	53	0.2913
H_{27}: Computation	13.58	11.42	59	0.4776
H_{28}: Geometry	14.71	10.29	45.5	0.1277
H_{29}: Measurement	15.42	9.58	37	*0.0449
H_{30}: Using Charts	16.38	8.63	25.5	**0.0056
H_{31}: Probability	16.21	8.79	27.5	**0.0083
H_{32}: Computer Literacy	13.75	11.25	57	0.4095
H_{33}: Methods	12.50	12.50	72	1.0000

U < 42 implies significance at .05 1-tailed or .10 2-tailed (52,277)
U < 31 implies significance at .01 1-tailed or .02 2-tailed (52,275)
*Indicates significance at .05 level
**Indicates significance at .01 level

graphs and tables, and probability at the $P < .01$ level. Significance was established for problem solving, reasonableness of results and measurement at the $P < .05$ level.

The perceptual framework of college mathematics educators was examined by hypotheses thirty-four through forty-four. The college mathematics educators perspective illustrated in Table 3 indicates there are mathematics inservice needs that are not being met in the following mathematics topics: problem solving, applications, reasonableness of results, approximation and estimation, probability and computer literacy. Significance was established for problem solving, applications, reasonableness of results, approximation, probability, and computer literacy at the $P < .01$ level.

The perceptual framework of school mathematics supervisors was investigated by hypotheses forty-five through fifty-five (Table 4). In the view of the school mathematics supervisors, the needs that were not being met were in the topics of problem solving; applications; reasonableness of results; approximation and estimation; probability; and computer literacy. Significance was established for problem solving, applications, reasonableness of results, approximation, probability, and computer literacy at the $P < .01$ level.

Tables 2, 3, and 4 exhibit the comparison of the need for, and the presence of, the eleven inservice topics. Significance in these populations means that in the groups' views there are mathematics inservice needs that are not being met. Two topics, approximation and estimation, and computer literacy, were significant in the views of the college mathematics educators and school mathematics supervisors but not for the teacher center directors. Measurement was the only topic that was significant for only

TABLE 3

COLLEGE MATHEMATICS EDUCATORS PERCEPTIONS OF
NEED AND PRESENCE OF INSERVICE TOPICS

Mathematics Inservice Topics	Mean Ranks (n = 12) Need	Presence	U	Exact 2-tailed P
H_{34}: Problem Solving	17.38	9.62	34	**0.0086
H_{35}: Applications	18.42	8.58	20.5	**0.0005
H_{36}: Reasonable Results	17.35	9.65	34.5	**0.0086
H_{37}: Approximation	18.77	8.23	16	**0.0002
H_{38}: Computation	12.46	14.54	71	0.5114
H_{39}: Geometry	15.00	12.00	65	0.3358
H_{40}: Measurement	14.38	12.62	73	0.5788
H_{41}: Using Charts	16.75	11.04	52.5	0.0609
H_{42}: Probability	17.15	9.85	37	**0.0140
H_{43}: Computer Literacy	17.65	9.35	30.5	**0.0042
H_{44}: Methods	15.12	11.88	63.5	0.2869

U < 51 implies significance at .05 1-tailed or .10 2-tailed (52,277)
U < 39 implies significance at .01 1-tailed or .02 2-tailed (52,275)
*Indicates significance at .05 level
**Indicates significance at .01 level

TABLE 4

SCHOOL MATHEMATICS SUPERVISORS PERCEPTIONS OF
NEED AND PRESENCE OF INSERVICE TOPICS

Mathematics Inservice Topics	Mean Ranks (n = 12) Need	Presence	U	Exact 2-tailed P
H_{45}: Problem Solving	19.93	9.07	22	**0.0002
H_{46}: Applications	18.54	10.46	41.5	**0.0079
H_{47}: Reasonable Results	18.89	10.11	36.5	**0.0035
H_{48}: Approximation	18.89	10.11	36.5	**0.0035
H_{49}: Computation	13.75	15.25	87.5	0.6347
H_{50}: Geometry	16.00	13.00	77	0.3519
H_{51}: Measurement	15.54	13.46	83.5	0.5112
H_{52}: Using Charts	16.50	11.68	58.5	0.1159
H_{53}: Probability	20.29	8.71	17	**0.0001
H_{54}: Computer Literacy	18.71	10.29	39	**0.0058
H_{55}: Methods	14.04	14.96	91.5	0.7688

U < 61 implies significance at .05 1-tailed or .10 2-tailed (52,277)
U < 47 implies significance at .01 1-tailed or .02 2-tailed (52,275)
*Indicates significance at .05 level
**Indicates significance at .01 level

teacher center directors. There existed five topics that all three groups agreed upon. These five topics of agreement are problem solving; applications, reasonableness of results; using charts, graphs and tables; and probability. This indicates that there is a need for the inclusion of these mathematics topics in the inservice and it is not present in current mathematics inservice.

Table 5 considers the total perceptual framework of the teacher center directors, college mathematics educators, and school district administrators regarding mathematics inservice needs. This analysis examined the eleven areas with respect to one another. Significance indicates that there is a high need in some areas and low in others. Within the perceptual framework of teacher center directors and college mathematics educators there did not exist significant differences among mathematics needs. In the case of the school mathematics supervisors, there was a significant difference in the views regarding mathematics inservice needs at the $P < .01$ level. A further review of the data indicates the disparity which exists between a high demand for problem solving and computer literacy and at the same time a low need for computation and geometry inservice.

Summary

Twelve teacher center directors, thirteen college mathematics educators and fourteen school mathematics supervisors were surveyed for the purpose of comparing eleven mathematics topic needs and presence each group perceived.

The collected data were analyzed using nonparametric statistics, namely, the Kruskal-Wallis one-way analysis of variance by rank test and the Mann-Whitney U-test.

TABLE 5

TOTAL PERCEPTUAL FRAMEWORK OF TEACHER CENTER DIRECTORS, COLLEGE MATHEMATICS EDUCATORS, AND SCHOOL MATHEMATICS SUPERVISORS REGARDING MATHEMATICS INSERVICE NEEDS

Inservice Topic	Mean Ranks H_{56}: Teacher Center Directors	Mean Ranks H_{57}: College Mathematics Educators	Mean Ranks H_{58}: School Mathematics Supervisors
Problem Solving	81.25	84.81	113.86
Application	85.54	84.81	90.64
Reasonable Results	57.04	56.19	73.43
Approximation	47.33	77.65	77.71
Computation	59.92	53.73	50.93
Geometry	46.17	62.27	53.93
Measurement	81.29	82.73	82.21
Using Charts	68.42	64.50	45.58
Probability	55.88	62.96	79.79
Computer Literacy	70.75	88.50	110.86
Methods	69.54	79.96	65.82
Significance Levels	0.122	0.274	**0.0000

*Indicates significance at .05 level
**Indicates significance at .01 level

In one of twenty-two mathematics areas there was a significant difference in the perceptual framework of the three groups. This area was the need for using charts, graphs and tables. The results showed four common mathematics areas of inservice need that were not being met. These areas were: problem solving; applications; reasonableness of results; and probability. Only the school mathematics supervisors perceptual framework with respect to needs held a significant difference among the eleven mathematics topics.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The Problem

In the past, mathematics inservice for teachers has been planned and conducted by college mathematics educators and/or school mathematics supervisors. Now teacher centers are playing a greater role in the classroom teachers' mathematics inservice. Teacher centers are designed in such a way that they may be more responsive to teachers' needs. The federally funded teacher centers contain an organizational form that has the potential to assess mathematics inservice needs and present appropriate mathematics inservice activities.

The purpose of this study was to investigate the potential of teacher centers to be more responsive to the mathematics inservice of teachers than are college mathematics educators or school district administrators. This was done by constructing a perceptual framework regarding the needs and presence of mathematics inservice activities for each of the three groups: teacher center directors, college mathematics educators and school mathematics supervisors. The mathematics activities were those identified by the National Council of Teachers of Mathematics (NCTM) as "Basic Skills" (2:18-21). These mathematics areas are problem solving; application; reasonableness of results; approximation and estimation;

computation; geometry; measurement; using graphs, charts and tables; probability; computer literacy; and methods of teaching.

Methodology

This perceived needs/perceived presence status study was designed to construct and compare the perceptual framework of teacher center directors, college mathematics educators and school mathematics supervisors. The investigation was accomplished through questionnaires returned from: federally funded midwest teacher center directors, college mathematics educators that were near these teacher centers, and school mathematics supervisors within the service areas of the teacher centers. The questionnaire was divided into two parts. The first part surveyed the Mathematics Inservice Needs (MIN) and the second investigated the Mathematics Inservice Program (MIP). The mathematics inservice topics identified on the questionnaire were problem solving; application; reasonableness of results; approximation and estimation; computation; geometry; measurement; using charts, graphs and tables; probability; computer literacy; and methods of teaching.

Results

Twelve teacher center directors, thirteen college mathematics educators and fourteen school mathematics supervisors were surveyed for the purpose of comparing eleven mathematics topic needs and presence each group perceived.

The collected data were analyzed using non-parametric statistics, namely, the Kruskal-Wallis one-way analysis of variance by rank test and the Mann-Whitney U-test.

In one of twenty-two mathematics areas there was a significant difference in the perceptual framework of the three groups. This area

was the need for using charts, graphs and tables. The results showed four common mathematics areas of inservice need that were not being met. These areas were: problem solving; applications; reasonableness of results; and probability. Only the school mathematics supervisors perceptual framework with respect to needs exhibited a significant difference among the eleven mathematics topics. The school mathematics supervisors recognized a high need for problem solving and computer literacy and a low need for computation and geometry.

Conclusions

The following conclusions may be stated regarding the perceptual framework of teacher center directors, college mathematics educators and school mathematics supervisors.

1. There are differences in the views of teacher center directors, college mathematics educators and school mathematics supervisors regarding the need for inservice on using charts, graphs and tables. Teacher center directors view a greater need for this topic than the other two groups.
2. There are no differences within the three groups regarding the needs for mathematics inservice in problem solving, applications, reasonableness of results, approximation and estimation, computation, geometry, measurement, probability, computer literacy and methods of teaching.
3. There are no differences within the three groups regarding the presence of inservice activities in

problem solving; applications, reasonableness of results; computation; geometry; measurement; using charts, graphs and tables; probability; computer literacy; and methods of teaching.

4. There are four mathematics inservice areas of need that are not being met. These areas are: problem solving; applications; reasonableness of results; and probability.
5. School mathematics supervisors view a greater need for problem solving and computer literacy and less need for computation and geometry inservice.

Recommendations

The following recommendations for mathematics inservice education are based on the study of the views of teacher center directors, college mathematics educators and school mathematics supervisors.

1. Teacher center directors, college mathematics educators and school mathematics supervisors are in general consensus regarding the mathematics inservice needs of teachers. Therefore, the three groups should work in collaboration to provide the most effective inservice.
2. There should be more mathematics inservice activities in the areas of problem solving; application; reasonableness of results; and probability.
3. According to local needs there should be more mathematics inservice in the areas of approximation and estimation, measurement and computer literacy.

The following recommendations for further research are based on the study.

1. The need for and presence of the identified eleven mathematics inservice topics as viewed by classroom teachers should be compared with that of teacher center directors, college mathematics educators, and school mathematics supervisors.

Since the classroom teachers are the individuals who will be helping the student master the identified mathematics, it is first essential that they recognize a need for inservice in the area. If they are motivated by a felt need for inservice, they will probably use the opportunity to change, and hopefully improve, their teaching of the mathematics topic. However, if they do not perceive the topic of inservice as a needed area, they either will not attend the inservice or will resist attempting changes where they feel it is not necessary. Therefore, a comparison of teachers' views with the views of the inservice leaders would be valuable.

2. Topics identified as areas of needed mathematics inservice should be compared to student's mathematics achievement records.

Regardless of the school's form for obtaining records of student's achievement, it will provide a means of assessing mathematical weaknesses. These areas may then be compared with the district's curriculum to create priority. Also, low student achievement levels should be an area for extensive inservice. Such as investigation will probably be restricted to a well-identified grade level.

3. Since not every school district will receive federal support for the operation of a teacher center, the centers resulting from other sources of funds should be compared and contrasted with the federal teacher center model.

There exist teacher centers that receive support from colleges, private foundations, state departments and other sources. Many of these centers have an organizational structure similar to the federally funded teacher centers. It would be valuable to describe these centers in some way so that they may be compared with respect to the delivery of appropriate mathematics inservice.

4. The mathematics inservice activities available at teacher centers should be compared with the activities available at the traditional inservice sources.

The teacher centers may be replicating other inservice programs in the conduct of its mathematics inservice activities. If this replication does exist, then a comparison of the results from each source should be investigated. Differences may be attributed to the setting, the personnel, or the participants' expectations. A comparison by topic may indicate that one setting is more appropriate for a particular topic.

5. For any given mathematics area a longitudinal study of student achievement could be conducted.

Such a study might compare two school districts. The main difference between the districts being that one is involved with a teacher center for its inservice program and the second relies

on other forms of inservice education. The investigation would consider student achievement levels before the teacher center existed with student achievement levels after the center has been in operation for several years.

6. Mathematics inservice activities in the areas of problem solving, applications, reasonableness of results, and probability should be evaluated.

These mathematics topics are the areas of need that are not being met. Consequently, each of these topics should be studied so that a set of valuable inservice activities may be found to satisfy the perceived inservice need.

7. The amount of class time the teacher devotes to each mathematics topic could be compared with the opportunity for inservice in the same mathematics topic.

Teachers may be more motivated to try ideas they have most recently learned rather than spend time pursuing other topics. At times, this may result in the emphasis of one mathematics topic at the expense of other topics.

8. The teacher's competence in a given mathematics topic could be compared with the class time that the teacher spends in activities related to that particular mathematics topic.

Teachers may be ignoring an area of mathematics because they feel that their own background in the area is inadequate

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APPENDIX A

SAMPLE LETTER MAILED TO SUBJECTS

TEACHER CENTERS INCLUDED IN THE STUDY

3031 Winther Hall
University of Wisconsin-Whitewater
Whitewater, Wisconsin 53190
September 15, 1979

Dear

Enclosed is a short questionnaire related to mathematics inservice needs and activities in your area. This survey is a part of the research I have undertaken to complete a degree program.

In return for your assistance in completing this form, I would like to send you a copy of the Teacher Ideas Book recently published by the Teacher Place. The Teacher Place is an independent teacher center in southeastern Wisconsin, and this book is full of excellent ideas you will want to share with teachers that you know. The book will be sent as soon as I receive your completed questionnaire. For this reason each questionnaire is numbered; however, no respondents will be identified in the report of this research.

Please return the completed questionnaire in the enclosed self-addressed stamped envelope as soon as possible. Thank you for your assistance.

Mathematically,

Phil Makurat

TEACHER CENTERS FUNDED

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Teacher Center for Area Education
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Livonia Public Schools District
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Consortium
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Livonia, MI 48154

Normandy School District
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7837 Natural Bridge
Normandy, MO 63121

APPENDIX B

MATHEMATICS INSERVICE NEEDS ASSESSMENT INSTRUMENT

MATHEMATICS INSERVICE PROGRAM ASSESSMENT INSTRUMENT

MATHEMATICS INSERVICE NEEDS (MIN)

* *

DIRECTIONS: FOR EACH ITEM PLACE AN X ON THE LINE AT THE POINT THAT BEST THE MATHEMATICS INSERVICE NEEDS OF YOUR AREA.

* *

1. To what extent do you feel that there is a need for inservice on problem solving?

   - solving work problems
   - analyzing situations
   - drawing diagrams

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

2. To what extent do you feel there is a need for inservice on applying mathematics to everyday situations?

   - translate situations into formulas
   - know what operation to use

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

3. To what extent do you feel there is a need for inservice on determining if results are reasonable?

   - check the answer in the problem
   - check the intermediate steps

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

4. To what extent do you feel there is a need for inservice on estimation and approximation?

   - rounding off numbers
   - estimating distances
   - estimating lengths, sizes, etc.

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

5. To what extent do you feel there is a need for inservice on computational skills?

·addition, subtraction, multiplication and division of whole numbers and decimals
·number facts
·mental arithmetic

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

6. To what extent do you feel there is a need for inservice on geometry?

·terms such as point, line, plane
·ideas concerning perpendicular, parallel
·3-dimensional objects

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

7. To what extent do you feel there is a need for inservice on measurement?

·distance, time, weight and temperature
·angles
·area and volume

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

8. To what extent do you feel there is a need for inservice on using tables, charts, and graphs?

·reading and constructing graphs
·drawing conclusions from tables

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

9. To what extent do you feel there is a need for inservice on probability?

·using math to predict
·random events

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

10. To what extent do you feel there is a need for inservice on computer literacy?

    - understand what computers can and cannot do
    - uses of computers in business

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

11. To what extent do you feel there is a need for inservice on teaching methods?

    - math games
    - group activities

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed
|_____	_____|_____	_____|_____	_____|_____	_____|

MATHEMATICS INSERVICE PROGRAM (MIP)

* * * *

16. To what extent do current mathematics inservice activities include computational skills:

- addition, subtraction, multiplication and division of whole numbers and decimals
- number facts
- mental arithmetic

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

17. To what extent do current mathematics inservice activities include geometry?

- terms such as point, line, place
- ideas concerning perpendicular, parallel
- 3-dimensional objects

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

18. To what extent do current mathematics inservice activities include measurement?

- distance, time, weight and temperature
- angles
- area and volume

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

19. To what extent do current mathematics inservice activities include using tables, charts and graphs?

- reading and constructing graphs
- drawing conclusions from tables

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

20. To what extent do current mathematics inservice activities include probability?

·using math to predict
·random events

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

21. To what extent do current mathematics inservice activities include computer literacy?

·understand what computers can and cannot do
·uses of computers in business

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

22. To what extent do current mathematics inservice activities include teaching methods?

·math games
·group activities

Definitely Not Needed	Probably Not Needed	Uncertain	Probably Needed	Definitely Needed

APPENDIX C

CONTENT VALIDITY INSTRUMENT

CONTENT VALIDITY

Directions: Please review the items on the attached Mathematics Inservice Survey and then answer the following five queries about the Survey. Circle one of the numbers: 1, 2, 3, 4 or 5.

1. To what extent do the questions/items reflect a representative sample of the total universe of math inservice areas?

1	2	3	4	5
Lack of any representation				Representation of the highest order

2. To what extent are the questions/items indicators of relevant mathematics inservice activities?

1	2	3	4	5
Total lack of relevance				Relevance of the highest order

3. To what extent would it be realistic to develop inservice activities based on these questions/items?

1	2	3	4	5
Not realistic				Most realistic

4. To what extent do the questions/items reflect a representation of the K-8 mathematics curriculum?

1	2	3	4	5
Lack of any representation				Representation of the highest order

5. To what extent do the questions/items reflect the important issues of mathematics inservice?

1	2	3	4	5
Lack of any representation				Representation of the highest order

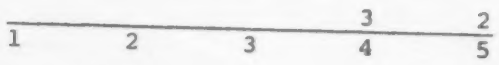
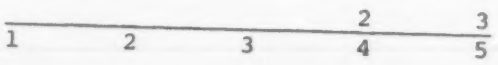
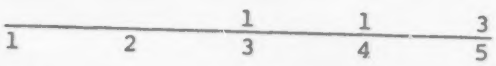
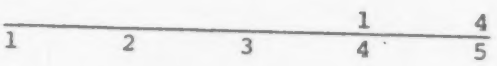
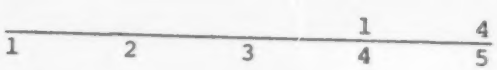
Please add any comments you may have about the instrument--THANK YOU!

APPENDIX D

SUMMARY OF VALIDITY TEST

SUMMARY OF RELIABILITY TEST

CONTENT VALIDITY

Items	Summary of Responses
1. To what extent do the questions/ items reflect a representative sample of the total universe of math inservice areas?	 Lack of any representation — Representation of the highest orders
2. To what extent are the questions/ items indicators of relevant mathematics inservice activities?	 Total lack of relevance — Relevance of highest orders
3. To what extent would it be realistic to develop inservice activities based on these questions/items?	 Not realistic — Most realistic
4. To what extent do the questions/ items reflect a representation of the K-8 mathematics curriculum?	 Lack of any representation — Representation of the highest orders
5. To what extent do the questions/ items reflect the important issues of mathematics inservice?	 Lack of any representation — Representation of the highest orders

RELIABILITY

	First Administration	Second Administration
Respondent 1 Teacher Center Director	38	37
Respondent 2 Mathematics Education	50	52
Respondent 3 Mathematics Education	48	42
Respondent 4 School Mathematics Supervisor	50	49
Respondent 5 School Mathematics Supervisor	36	39

Pearson's Product Moment Correlation Coefficient = 0.80

VITA

Personal Information

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Born: 19 November 1941
Married: Sharon L. Belling
August 1963
Children: Camille, born 1965
Adam, born 1975

Academic History

University of Wisconsin-Oshkosh, 1959-63
Bachelor of Science with majors in Mathematics and Physics

University of Notre Dame, 1964-1967
Master of Science in Mathematics

University of Wisconsin-Madison, 1968-1972
Mathematics computer science courses

Employment History

1963-66	Clark County School District, Las Vegas, Nevada Junior high and high school mathematics teacher
1967-68	University of Notre Dame, Notre Dame, Indiana Taught calculus
1968-present	University of Wisconsin-Whitewater Taught secondary mathematics methods and seminar, and supervised student teachers and interns in mathematics